

1. Opening remarks and introductions

The Chairman, Don Tolmie of Los Alamos National Laboratory, opened this HIPPI-6400 meeting and thanked Paul Boulay and Hitachi for hosting this meeting. This group is constituted as both the HIPPI special working group (SWG) under X3T11, and the HIPPI Networking Forum (HNF) - Technical Committee (TC).

Don then lead a round of introductions. The list of attendees is at the end of these minutes.

2. Review / modify the draft agenda

The draft agendas were available on the web prior to the meeting. Hard copies were available at the meeting. Roger Ronald added Raytheon/E-System's open issues listed as item 8. These minutes reflect the approved agenda. James Hoffman of Los Alamos volunteered to take the meeting minutes.

3. Review minutes of previous meetings

3.1 July 10-11, 1996, Mountain View, CA

The Mountain View minutes were reviewed and approved as written.

3.2 Review action items from Mountain View meeting

1. Stan Swirhun, and others, to consider problems with FRAME signal frequency in optical implementations. (Done, not a problem)
2. Greg Chesson to provide Don Tolmie with the parallel CRC equations to be added as an annex. (Carryover)
3. James Hoffman to verify CRC error protection results. (Carryover)
4. Roger Ronald to define Admin micropacket contents and requirements and present to e-mail. (Done, see 5.2)
5. Greg Chesson and SGI to specify the order that bits are fed into the LCRC calculation. (Carryover)
6. Greg Chesson and SGI to provide text on what actions occur as a result of a Shutdown. (Carryover)
7. Greg Chesson and SGI to check the initial pattern for Reset operations and the need for the 10 second line-charge time. (Done)
8. Greg Chesson and SGI to review the error conditions in 9.1. Check the grouping, ordering, names, and field sizes. (Done)
9. Greg Chesson and SGI to review the Scheduled Transfers in clause 7 with special attention to Bufr. (Done)
10. Greg Chesson to provide ARP text for inclusion in HIPPI-6400-SC. (Carryover)
11. Greg Chesson to draft initial text for bridging. (Carryover)
12. Greg Chesson to provide examples of OS Bypass prior art to Francois Gaullier of HP. (Done)
13. Jim Davis of Raytheon E-Systems to propose text for the "missing end of Message" error text in 9.1.4. (Done)
14. Joe Parker of Optivision to query fiber cable and connector vendors as to a reasonable skew adjustment requirement. (Done)
15. Michael McGowen of Essential Communications to detail the use of the "Transtype" parameter. (Carryover)
16. Michael McGowen to describe the ULA and EtherType fields and their usage. (Carryover)
17. Michael McGowen to send Don Tolmie an electronic copy of HIPPI-AC for placement on the HIPPI web page. (Done)
18. James Hoffman of Los Alamos to finish an informative annex dealing with scheduled transfers – specifically, including examples, detailing the use of Bufr and Offset, and describing methods for dealing with related errors. (Done)
19. Roger Ronald to propose uses for Admin micropackets. (Done)
20. Von Welch of NCSA to provide a draft HIPPI-6400 MIB. (Done)
21. Hansel Collins of SGI to finalize the training sequence. (Done, see 4.4)

22. Hansel Collins to check the ± 200 ppm bit rate tolerance value. (Carryover)
23. Hansel Collins to check the $50\% \pm 5\%$ CLOCK symmetry value. (Carryover)
24. Hansel Collins to check the 600 mV minimum output voltage value. (Carryover)
25. Hansel Collins to check the 10% deterministic jitter value. (Carryover)
26. Hansel Collins to check the 10% random jitter value. (Carryover)
27. Hansel Collins to check the ≤ 0.05 ns peak jitter value. (Carryover)
28. Hansel Collins to check the 0.6 ns (20-80%) rise and fall time values. (Carryover)
29. Hansel Collins to determine the receiver's common mode range. (Carryover)
30. Craig Davidson of Raytheon E-Systems to propose the voltages and currents necessary at the connector. (Carryover)
31. Craig Davidson to propose the connector pin assignments. (Done)
32. Ed Cady of Berg Electronics to determine the connector loss value. (Done)
33. Ed Cady to determine the connector crosstalk value. (Done)
34. Steve Forman of Berg Electronics to provide Don Tolmie with the necessary connector drawings for inclusion in HIPPI-6400-PH. (Done)
35. Don Tolmie to provide ANSI patent release forms to Steve Forman of Berg Electronics. (Done)
36. Ron Nickel to construct and test a signaling filter. (Carryover)
37. Don Tolmie to update HIPPI-6400-PH Rev 0.3 with the changes agreed to at the Mountain View meeting. (Done)
38. Roger Ronald to update HIPPI-6400-SC Rev 0.3 with the changes agreed to at the Mountain View meeting. (Done)

4. Review HIPPI-6400-PH changes since last meeting (reference HIPPI-6400-PH Rev 0.4)

4.1 Minor changes first and then return to the more detailed ones

Added a bullet regarding Scheduled Transfers to the Scope - accepted.

Added a definition for ULA (Universal LAN Address) - accepted.

Added section 4.5 describing Scheduled Transfers in the overview - accepted with the intent of correcting when Scheduled Transfers are finalized.

In 4.9 the text does not describe any ECRC action when only a single micropacket is sent, e.g. Admin, Credit-only. Don Tolmie will add some text for the next revision.

4.10 can be updated somewhat with information from recent copper meetings

6.3.2 will be revised so that Null micropackets don't account for any retraining mechanism.

Added text in 6.6.3 describing the ECRC implementation similar to the text describing the LCRC - accepted.

It was noted that a Message can be "one or more" micropackets and to check the capitalization of the word "Message" throughout the document.

Various errors can result on the Source side of the link and a Source errors section will be added to 8. These errors include: RSEQ_Missing_Error for every time an ACK time-out goes off; RSEQ_Out_of_Range_Error if the Source is given an RSEQ that doesn't match any unacknowledged TSEQ values; and ECRC_Source_Error when a non-originating Source ECRC checker detects an ECRC error and sets the Error bit. These have been added to Table 11.

The second paragraph of 8.2 has certain anomalies that will be fixed between meetings. Greg Chesson received an action item to review the second paragraph of 8.2.

The last paragraph of 8.2 describing retransmission was moved to 8.4.

Table 11, the "Retry_Error" was renamed to "Retransmission_Error".

Section 13.1 that specifies error counter shall not roll over is new text and was accepted after changing the last sentence into a Note under table 11.

All timer operations were unified and placed into section 13.2 - accepted.

4.2 Destination Specific Operations (error checking) (pages 28, 29, 38)

Removed references to link level (and lever).

The last condition of 9.1.2 was removed and the second condition is under examination by SGI.

It was requested that ECRC be specifically defined as ending on the tail micropacket of a Message to assist with error checking.

An open issue was raised about whether the document should provide unspecified types as a reserve for the future or use all the TYPE values now. Greg Chesson was granted a further action item to propose a solution for unspecified TYPE values and whether they should be handled as errors.

In 9.2.2 the "and no errors shall be logged" was removed and will be left to the implementer.

Table 11 listing the logged errors was changed so that the same error occurring on different VC's were grouped together - accepted.

4.3 Initialization, Reset, Shutdown (pages 35,37)

The Initialize and Reset flow diagram was changed as noted in the "Comments on Rev 0.4" at the front of the document. All groups agreed to review the figure for any possible deadlock situations.

4.4 Training Sequence (page 34-35)

Greg Chesson provided Don Tolmie with a copy of the new training sequence devised by Hansel Collins. The new Training Sequence consists of three parts: a 9 and 10 ns Training detect pattern that changes the disparity to 0 or -1; a 14 ns Flush Sequence where all lines stay low; and a 14 ns Ping Sequence where the deskew circuitry detects the rising edge and deskews all lines on an edge and frame basis.

4.5 Header micropackets contents (page 14)

Some Schedule Header field definitions were refined and unified - accepted.

Greg Chesson and Michael McGowen considered the problem of Message translation when the Schedule Parameters were not present. They decided to move all Schedule Header fields into the second micropacket. The MAC Header micropacket will contain all translation parameters (including ULA's, EtherType, and any translation flags required by the

translator. The translation parameters are now sent in every Message. Greg Chesson took an action item to review the Scheduled Transfer with SGI and to present Don Tolmie with the new field ordering.

The T-id (Transfer ID) has been expanded to 32 bits to prevent any aliasing situations and as an added security measure.

Michael McGowen felt that he could translate the HIPPI FP header without encapsulating FP, but the group needs convincing. Michael McGowen was given the action item to decide whether FP can be translated.

4.6 Scheduled Transfers (page 15, 26)

It was agreed that the Final Destination will include a VC identifier in the Opcode of an CTS operation. The Originating Source should use this VC for all DATA operations. A Final Destination may not suggest VC0 for Scheduled Transfers nor ask to use VC1 or VC2 when the maximum Message size exceeds 128 Kbytes (plus 32 bytes).

Now that the T-id is 32 bits, the exchange Keys can be traded in the T-id field during RQP and RQP_Response operations.

The group asked Don Tolmie to unify Tables 6 & 7 with the operational text so that both refer to the same D-port, R-port and Key parameters. To decrease confusion, the group decided to use "dst" and "src" as prefixes for ports and keys in Table 6.

Don Tolmie asked the group if the use of the word Transfer (the overall data being shipped) and the phrase Scheduled Transfer cause any confusion. The group accepted the current naming scheme.

4.7 Annex C (separate draft)

The Annex C was available on the web page and distributed at the meeting. James Hoffman asked for comments and received various word choice and uniformity suggestions.

The group ran through the example section to explain the Scheduled Transfer in detail. The group decided to require the Buf-size parameter exchanged during port setup to be an integral power of two. This will force buffer sizes to be integral and will definitely improve alignment concerns.

James Hoffman took an action item to revise Annex C with the suggested changes.

5. HIPPI-6400-SC

5.1 Review HIPPI-6400-SC changes since last meeting (reference HIPPI-6400-SC Rev 0.4)

Roger Ronald of E-Systems, the Technical Editor, presented the HIPPI-6400-SC Rev 0.4 document, but suggested due to the few changes in SC that the group concentrate the available working time on the Admin micropacket format. Changes to SC will continue to be reviewed at future meetings as Admin micropackets, auto configuration and ARP are added.

5.2 Admin micropackets

Roger Ronald presented his first draft of Admin commands to be incorporated into HIPPI-6400. The draft was refined and reorganized. The group was concerned about the fine line of keeping implementation freedom in the specification, yet maintaining interoperability. Roger Ronald agreed to incorporate changes to the document suggested at the meeting.

6. Optical interconnect (8 am - 9 am, and 3 pm - 6 pm Tuesday)

Some new attendees arrived so introductions were done again, and thanks again extended to Hitachi for hosting the meeting.

The following minutes only summarize the activities and presentations during this portion of the meeting. Stan Swirhun volunteered to provide detailed minutes of this portion of the meeting.

6.1 Early planning session (8 am - 9 pm)

The group met in the morning to plan the rest of the days activities. Don Tolmie handed out a low-cost (reach-challenged) and high-performance optics fill-in-the-blank specification sheet that borrows from current Fibre Channel specifications. The fiber group met separately at 1:15 pm to discuss the high-performance fiber and presented their conclusions at 3pm.

6.2 Presentations

Mike Griffin of 3M presented a table categorizing all the specifications presented at the Santa Fe meeting. Attending companies corrected any omissions or problems they noted. The table may be displayed on the web page assuming all listed companies consent.

Steve Joiner of Hewlett-Packard gave the group a brief tutorial on eye-safety issues that are a prime concern for parallel fiber optic transmission. Preliminary results show that lower cost vertical cavity lasers require a smaller wavelength which presents an eye safety problem. Possible solutions include: longer wavelength, shorter distances, incorporating open fiber control, shutters, or high launch NA.

Joe Parker sent a partial parallel fiber skew list to the reflector. During the meeting, the optical groups agreed that the maximum skew in a 1 km link fiber would be 5ns and less than 1ns skew in either the transceiver or receiver. This allows a short copper link to connect to a fiber repeater without having to re-clock the signals.

6.3 Work planning

The fiber group noted that the low-cost optical choice differs enough so that a special working group for that option should be formed independent of the high-performance optical group.

In October the various connector vendors will give presentations on their connectors and show how they meet or exceed various connector criteria listed at the meeting. See the optical interconnect minutes for exact specifications. The specifications will also be placed on the HIPPI reflector.

Schedule for HIPPI-6400 Optical Development

AUG-plenary	schedule, issue generation
SEPT-teleconf	electrical specs, connector criteria
OCT-plenary	eye safety specs, connector presentations with prototypes
NOV-teleconf	TBD
DEC-plenary	connector available with samples, connector decision

7. Copper interconnect (6 pm - 9 pm Tuesday)

Some new attendees arrived so introductions were done again, and thanks again extended to Hitachi for hosting the meeting.

7.1 Brief overview of requirements

As a starting point, Don Tolmie presented the list of items generated at the end of the copper portion of the HIPPI-6400 meeting in Mountain View. The following items were change:

1. Transmitter Output Voltage min: bring closer to max
2. Cable length < 50 meters
3. Cable Type = STP/mini-twinax
4. Cable Ground of Individual Shields = floating
5. Cable Attenuation < 0.5 dB/m @ 500 MHz
6. Connector Loss = .03 @ 250 MHz differential
7. Connector Crosstalk pin-to-pin < 500ps (1.7%)
8. Single Voltage connector
9. Connector Shield tied to chassis ground on 2 pins at one end, capacitor coupled at other end, and marked on cable.
10. Connector Cable exit = 60 degrees (optional)

7.2 Presentations

Craig Theorin of Gore presented cable specifications for HIPPI-6400 describing distance, attenuation, eye patterns, etc.

James Hoffman presented Al Widmer's (of IBM) worst case pattern at the receiver end of a 30 meter 500 MHz line tester developed by Gene Dornhoff. The low frequency component did not appear to be a problem even with the 1 MHz filter. The pattern used was presented by Al at the Santa Fe meeting.

7.3 Work planning

It was agreed to meet with the IBM/3M Jitney group at the upcoming Albuquerque meeting and compare possibilities with the copper group.

8. Other "Open Issues" not covered yet

Roger Ronald presented Raytheon/E-Systems list of major unresolved issues in the HIPPI-6400 specification and his plans on solving these issues.

9. Future meeting schedule

9.1 September 11-12, Albuquerque, NM

Wednesday, September 11 -
1 PM - 9 PM — HIPPI-6400

Thursday, September 12 -
9 AM - 3 PM — HIPPI-6400
3 PM - 6 PM — HIPPI-6400 limited distance optical

The location is on the Fred Harvey Best Western Hotel at the Albuquerque airport. Don Tolmie and the Los Alamos National Laboratory are the host. (See the meeting announcement on the web page at <http://www.cic-5.lanl.gov/~det/> for further details.)

9.2 October 7-8, 1996, St. Petersburg Beach, FL

During the X3T11 October plenary week, the following HIPPI meetings are scheduled:

Monday, October 7 -

9 AM - 9 PM — HIPPI-6400

Tuesday, October 8 -

9 AM - 10 AM — HNF Plenary

10 AM - 3 PM — HIPPI-TC General and -6400

3 PM - 7 PM — HIPPI-6400 Optical (pick a ferrule)

7 PM - 9 PM — HIPPI-6400 Copper (tentative)

The location is the Tradewinds Hotel in St. Petersburg Beach, FL. Charles Brill and AMP are the host. (See the meeting announcement on the web page at <http://www.cic-5.lanl.gov/~det/> for further details.)

9.3 Future meetings

The schedule for the rest of 1996 is listed below. The Plenary meetings include HIPPI-6400, an HNF plenary, and all other HIPPI items. The Interim meetings cover just HIPPI-6400 items.

1996 -

Nov 6-7	Interim	Phoenix, AZ	Lockheed
Dec 2-3	Plenary	Minneapolis, MN	IBM

The following 1997 X3T11 plenary week dates are firm, but some locations and hosts are still fluid.

1997 -

Jan 8-9	Interim	Phoenix, AZ	Lockheed
Feb 3-4	Plenary	San Jose, CA	Sun
Mar 5-6	Interim	??	Berg
Apr 7-8	Plenary	Palm Springs, CA	Brocade
Jun 9-10	Plenary	Seattle, WA	Boeing
Aug 4-5	Plenary	Honolulu, HI	Hitachi
Oct 6-7	Plenary	Tucson, AZ	FSI
Dec 1-2	Plenary	Orlando, FL	DPT

10. Review action items

All of the following action items apply to HIPPI-6400.

1. Greg Chesson to provide Don Tolmie with the parallel CRC equations to be added as an annex.
2. James Hoffman to verify CRC error protection results.
3. Greg Chesson and SGI to specify the order that bits are fed into the LCRC calculation.
4. Greg Chesson and SGI to provide text on what actions occur as a result of a Shutdown.

5. Greg Chesson to provide ARP text for inclusion in HIPPI-6400-SC.
6. Greg Chesson to draft initial text for bridging.
7. Michael McGowen of Essential Communications to detail the use of the "Transtype" parameter.
8. Michael McGowen to describe the ULA and EtherType fields and their usage.
9. Hansel Collins to check the ± 200 ppm bit rate tolerance value.
10. Hansel Collins to check the $50\% \pm 5\%$ CLOCK symmetry value.
11. Hansel Collins to check the 600 mV minimum output voltage value.
12. Hansel Collins to check the 10% deterministic jitter value.
13. Hansel Collins to check the 10% random jitter value.
14. Hansel Collins to check the ≤ 0.05 ns peak jitter value.
15. Hansel Collins to check the 0.6 ns (20-80%) rise and fall time values.
16. Hansel Collins to determine the receiver's common mode range.
17. Craig Davidson of Raytheon E-Systems to propose the voltages and currents necessary at the connector.
18. Greg Chesson to review the second paragraph of 8.2.
19. Greg Chesson to propose a solution for unspecified TYPE values and whether they should be handled as errors.
20. Greg Chesson to review the Scheduled Transfer with SGI and to present Don Tolmie with the new field ordering.
21. Michael McGowen to decide whether FP can be translated.
22. James Hoffman to revise Annex C with the suggested changes.
23. Roger Ronald agreed to incorporate changes suggested at the meeting to the Admin micropacket draft.
24. Don Tolmie to update HIPPI-6400-PH Rev 0.4 with the changes agreed to at the Honolulu meeting.
25. Roger Ronald to update HIPPI-6400-SC Rev 0.4 with the changes agreed to at the Honolulu meeting.
26. Don Tolmie to find a sizable whacking stick to be applied liberally to anyone failing to complete their action items.

11. Adjournment

The attendants were released to the beach at 8:00 PM on Tuesday evening after two intense but informative days.

Attendance: (at main HIPPI-6400 meeting)

John Rossman	Access Japan
John Ellis	Berg Electronics
Barbara Weber	Berg Electronics
Jeff Young	Cray Research
Bob Willard	Digital Equipment Corp
Bob Pearson	Essential Communications
Perr Cardestam	Gigalabs
Francois Gaullier	Hewlett-Packard
Dru Popper-Lopez	HNF
Henry Brandt	IBM
James Hoffman	Los Alamos National Lab
Don Tolmie	Los Alamos National Lab
Von Welch	NCSA
Shinichi Habata	NEC
Craig Davidson	Raytheon E-Systems
Roger Ronald	Raytheon E-Systems
Pete Dean	Sandia National Lab
Art Beckman	Silicon Graphics
Greg Chesson	Silicon Graphics
Bob Newhall	Silicon Graphics
Max Lee	Silicon Graphic - Korea
David Deming	Solution Technology
Usao Morishita	Sumisho Electronics
Herb Van Dellsen	W.L. Gore and Associates

Attendance: (at HIPPI-6400 copper meeting)

Ed Cady	Berg Electronics
John Ellis	Berg Electronics
Bob Willard	Digital Equipment Corp
Henry Brandt	IBM
James Hoffman	Los Alamos National Lab
Don Tolmie	Los Alamos National Lab
Von Welch	NCSA
Craig Davidson	Raytheon E-Systems
Roger Ronald	Raytheon E-Systems
Greg Chesson	Silicon Graphics
Bob Newhall	Silicon Graphics
Herb Van Dellsen	W.L. Gore and Associates
Craig Theorin	W.L. Gore and Associates

Attendance: (at HIPPI-6400 optical meeting)

Michael Griffin	3M
Tad Szostak	3M
John Rossman	Access Japan
Charles Brill	AMP
Dan Brown	AMP
Jim Kevern	AMP
Ed Cady	Berg
Carol McGill	Corning
Jeff Young	Cray Research
Akinori Hashimoto	Dainichi
Bob Willard	Digital Equipment Corp
Bob Pearson	Essential Communications
Bill Boas	Essential Communications
Perr Cardestam	Gigalabs
Francois Gaullier	Hewlett-Packard
Steve Joiner	Hewlett-Packard
Christie Rice	Honeywell
James Hoffman	Los Alamos National Lab
Don Tolmie	Los Alamos National Lab
Norm Lampert	Lucent Technology
Yvonne Reeves	Lucent Technology
Vince Melendy	Methode
Virginia Haydu	Mitre
Von Welch	NCSA
Craig Davidson	Raytheon E-Systems
Roger Ronald	Raytheon E-Systems
Todd Hudson	Siecor
Eric Quinby	Siecor
Schelto van Doorn	Siemens
Greg Chesson	Silicon Graphics
Bob Newhall	Silicon Graphics
David Deming	Solution Technology
Mikio Kimura	Sumisho Electronics
Don Knessel	US Connect
Stan Swirhun	Vixel Corporation
Craig Theorin	W.L. Gore and Associates